

Con-Scious
Measurement and Representation
of Knowing

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Abstract

The classical hypothesis underlying measurement and representation of natural phenomena is based on the analytic proposition. The traditional assumption is that stimulus--response pairs can be studied with respect to intensity or power and resistance to change. In contrast, the Schema hypothesis advanced assumes the synthetic proposition as the foundation of an approach that observes dynamics and invariance under change as essential. The developed model and procedures for schematization (analysis by synthesis) of human behaviour, as it is reflected in natural language, is described and applied to an example text with the aim to give a detailed account of the presented rule system and its algorithmic functioning. The research method developed requires that intention as well as orientation can be differentiated and that verbal behaviour can be represented by means of synthetic concepts and their relationship. As a consequence, two ecologically oriented terms (perspective, viewpoint) take up a central position in the processing of verbal data and its topographical representation. The determination of the perspective latent in the flow of verbal behaviour depends both on the controlling function of the Agent component and on the empirical context. They have a constituting function in the model. The Agent defines and selects the viewpoints within a naturally (given) unity and governs their transposition and changes during textual transformation. The way the algorithm works through a text and the way in which an Objective can be described and differentiated from a perspective is illustrated through a three-dimensional topographical description of the dynamics in the specified concept relations. The covariations and interactions of the basic components established within the Schema approach are finally discussed with respect to emergent mental structures.

Unfolding Mentality by Natural Language Processing

Since Sperry's discovery of a formula for mind-brain interactions in the mid 1960s (Sperry, 1952; 1968; 1969; 1975; 1983) a number of experimental studies (Cook, 1986, pp. 120-135) give evidence to the overall importance of Kant's Schema concept as the methodological tool and conceptual framework for the logic of discovery. Kant declared that meaning can be comprehended only in terms of a synthetic proposition. In Kantian terminology the identification of analytic with synthetic concepts constitutes a Schema. A Schema has axiomatic properties and generates a formal system which is isomorphic with its field of research and thus merges the empirical with the formal aspect of the system (Hartman, 1967, pp 101-102).

A fundamental fact of all living systems is that they are self-referential and thus contain their own descriptions (Pattee, 1977; 1980). Further, in operation they make use of a dual steering and control mechanism (Cook, 1986, p. 181). Our fundamental hypothesis is that natural language must be treated as a self-referential system characterized by such a mechanism. The states of a system of this kind are determined by the mutual dependencies of its constitutive components. Self-referentiality implies that no master interpretation can be forced upon verbal expressions, i.e. text. When self-reference is concealed or non-detectable in verbal behaviour, it deprives us of the possibility of knowing what is folded and represented by strings of symbols. Further, if such strings cannot be recognized as intentional verbal behaviour, they cannot serve the purpose of carrying meaningful information.

Observing behaviour in individuals acting purposely in a meaningful environment is hardly possible without an organism's expression of an "intended" and "oriented" schematization (Bierschenk, 1984). Observation presupposes not only that a structure can be specified but also that intentionality and orientation can be observed. Intention signifies a property of an organism acting purposely. To incorporate the intentional component into a model implies that context is an indispensable part of such a model:

((int (A) a (ort (O)))

(1)

The first bracketed expression denotes that intention operates, which is

necessary in order for an organism (A) to be adaptive through cooperative actions (a). The second bracketed expression indicates the importance of the ability to orientate (ort) toward an Object(ive) (O).

In Kantian terms, an analytical proposition is at hand when the predicate is not contained in the subject. The ability to synthesize the connotations of an analytical proposition is given through the ability to generate analytical concepts which are the abstractions of experience, real or conceived. One of the analytical propositions frequently cited is:

A triangle is a three-sided figure (2)

It is analytic, since the term "triangle" can be substituted with "a three-sided figure" each time they coincide within a closed system such as the mechanism of symbolic logic. Thus, "analytic concepts are those whose intensions consist of predicates", which may be defined as "a set of words or symbols" (Craik, 1943, p. 29; Hartman, 1967, p. 31) which, by definition, must be a closed set. Kant declared that the connotations of the predicate which are contained in those of the subject must lead to synthetic propositions. In behavioural science terms, this means that psychological phenomena must be conceived as meaningful actions carried out by a responsible Agent. The smallest common denominator in the constructive process of the synthetic proposition is the relation between the Agent and the Object(ive) when both reside in the same organism, acting within a specified environment or context (Bierschenk, 1981). What is synthesized are the objects of nature, kept together by transcendental affinity, i.e. the necessary synthetic unity of appearance. The Schema guarantees the synthetic unity in Kant's transcendental logic.

The point of departure of the schematizing procedure is an unknown taken as known. This may be realized through the action "to study":

? study ? (3)

In that the A- and O-components of formula (1) have been substituted with question marks, operational manifestations within a specified context can be studied. An example of an operational manifestation within the context of the well-known 'Visual Cliff' experiments may be illustrative:

The researcher observed infants

(4)

The manifestations in the expression belong to an observation made within a scientific context. The researcher is the Agent who performs a series of actions, and the infants the ones who function as the Objective of observation and study. The relation between 'The researcher' and 'infants' is then given in the relationship holding between Agent and Objective. Thus, the axiom of this approach to observed behaviour is the Schema, which imposes a constitutive function on the context.

If, for example, it may be assumed that the infants do not represent the objects of study but instead the phenomenon of development, then the study would concern their behaviour. The phenomenon, the scientific focus, is being elucidated through the infants acting toward certain Objectives. Therefore, the researcher's observations manifest themselves in a series of AaO relations at the moment of observation:

(Aa(AaO, AaO, ..., AaO))

(5)

Within the expression (5) a strict dependency between coordinatively operating components creates synthetic concepts. When it comes to present observations as a series, this is continuously done in the form of a process linearizing the phenomenon to be expressed. Thus, the observations are given a syntactically coherent form. The functioning of the Schema in formalizing knowing is illustrated by the following example:

The researcher	A(1)	the knower	(6)
observed	a		
Aa(*)	O	the known (integrated experience)	
that			
the infants	A(2)	the experiencer	
crawled	a		
over the cliff	O	the environment	

The dummy (*) symbolizes some environmental or contextual variable, which may be an object or event. In this case it is an event, which incorporates an Agent and an environment. The relation between the two Agents is asymmetrical in the sense that Agent(2) is experiencing an unknown environment, while Agent(1) has already integrated this kind of experience. The experiencer--environment relation is known to him.

Consequently, in his observations (as reported verbally) the knower is always present in the known. Whenever a knower intuitively knows the unity, it appears as one whole. In this sense, Kant has given a precise definition of intuition in his concept of Schema. Because the relationships among various parts of a text are maintained as a result of Kant's transcendental logic, the topological structure of a text transcends both physical and mental realities in which they become realized.

In summary, the method developed takes the production of natural language in the form of speech or text as an expression of an Agent's (A) cooperation (a) with some environment (O) with the aim of finding its absolutely simple constituents and its mechanism of transference. The experience of the Agent builds on actions which incorporate intention and orientation, implying both to be integrated in the verbal flow. The synthesis based on Kant's schematism is its reconstruction in a different, i.e. topological dimension. In general, any consciousness that can be formulated into text would be an expression of a purposive act. Therefore, it is postulated that the quality in a verbal expression is defined by its underlying Schema.

AaO as Steering Mechanism

The Schema marks the structural aspect of a string of symbols. Schematizing incorporates the assumption of higher order functions in the verbal flow which are not directly apparent from the analysis of syntactic categories. As a generative process, schematizing implies a synthesis in agreement with the ability of self-reference. Thus, there is very little reason to doubt the preciseness and completeness of natural language when used in a natural context. The metaphoric properties of language, moreover, allow people to communicate information put into perspective, which is always unambiguous. By the metaphoric use of language we therefore assume the natural, not semantically based ability to conceptualize.

Natural Boundaries of Perspectivation

Whenever observational events structure the language of an observer, this language contains information belonging to these events. Events are, basically, the discontinuities in the textual flow. Observations are usually reported as processes, which means that events are nested within events. But since the individual needs to know what has moved

or changed, observations are put into a coherent textual form. Therefore, language contains textual markers which indicate where an event begins or ends.

In the moment of text production, an observation is put into perspective. The perspective is defined through two points. One is the point of observation and the other the point of view, e.g., the horizon. Within these boundaries processing of information comprises variable measurement or viewpoints which are focused to varying degrees. The textual expression of the degree of variation is the distance between the point of departure (= beginning of running text) and the folded and serially ordered viewpoints of the text. There is a general topographic correspondence between the events and the information presented through language. While maintaining its topographical coherence, the nature of the information contained in a particular text changes as the process of textual production progresses from one terminal state to the next (Bierschenk & Bierschenk, 1986 c).

The graphical reproduction of an observer's perspectivation is essentially a pattern of strings of symbols and spaces in between demarcated by a point at the beginning and end of each pattern. That these strings carry the symbolic information commonly associated with words is of no relevance in a systemic determination of information. On the other hand, language has to contain specific information that can be picked up from these carriers by an algorithmic functioning device. The following example defines a graphical sentence:

(.) ----- .

(7)

The strings of symbols are represented by (-----) and the lexical notions of sentence markers are contained in a dictionary.

The algorithm also has to work with clause openers which have the function of demarcating the boundaries of a clause except for the end of running text. Clause openers may be word grapheme as well as junctional graphemes. A graphical clause is part of a sentence as illustrated by the following expression:

. ----- that ----- , ----- .

(3)

A clause opener succeeded by another one defines the boundary as the end of a sentence in the technical sense. Thus, any first clause opener of a series is redefined as sentence marker. By this measure, the algorithm brings out implicit sentence markers:

. ----- , and ----- . (9)
 . ----- , (.) and ----- .

Any sentence boundary marked this way (9) implies a restart in the process of analyzing sentences. Start markers have to be utilized whenever a natural clause opener is missing. Thus, the clause opener (that) enclosed by parentheses carries this technical function:

.(that) ----- , (.) and ----- . (10)

The algorithm defines on purely formal grounds the organizational frame of a sentence. But this frame is insufficient for processing the perspective in the verbal flow. What is required for a final analysis is a structural component. This component is represented by the verb. Without the identification of a verb, it is impossible for the algorithm to disclose a mental process. If the algorithm identifies two or more verbs, this will result in a restart as many times as there are verbs. A procedure keeps track of the number of verbs within a particular clause and inserts immediately before the last of any two verbs the technical clause opener (that):

, ----- v ----- v ----- , (11)
 , ----- v ----- (that) v ----- ,

As verbs are recognized all finite and infinite inflected verbal forms and participles inflected in concord with the grammatical subject. The following form categories valid for Swedish may be illustrative:

imperative (titta = look)
 present tense (tittar = looks)
 preterite indicative (tittade = looked)
 preterite conjunctive (sutte = sat)
 infinite (sitta = sit)
 present participle (sittande = sitting)
 perfect participle (motiverad = motivated)
 supine (tittat = looked)

The definition is based on the assumption that the verb as predicative category and word class has to carry the controlling function in the final decision as to whether a clause is present or not. A consequence of this definition is that particle--verb compounds and reflexives are not contained in the verb concept nor are other passive constructions included, except the passive "s". This implies that deponent verbs are considered to be part of the passive construction expressing an unknown Agent. Furthermore, the definition circumvents all problems associated with auxiliary verbs. Such verbs are treated as autonomous verb forms, that cause the algorithm to initiate the analysis of a new clause whenever an auxiliary and a main verb coincide.

From a structural point of view, it has turned out to be an advantage to treat the auxiliary verbs as basic verbs. Basic verbs such as "shall" and "have" seem to be associated with fundamental life conditions (Jaynes, 1976, p. 51) and are for actions as imperative as "go" and "stop" are for a mechanically functioning system. At some stages of development, human perspective was very shallow and only functional development, i.e. the combination of a verb with other verbs, could absorb a language based frame of action (I. Bierschenk, 1989). It is worth noting that a few basic verbs are immediately accessible in critical situations and under time pressure, or when freedom of action is constraint and choice of strategy unclear (Bierschenk & Bierschenk, 1986 d). Moreover, the indicated algorithmic use of basic verbs resulted in clarity and precision of the analysis process. Finally, the copula "is" has traditionally the task to connect a main word with an attribute in a symmetrical relation. The algorithm recognizes "is" in the same way as any other verb in a directed, i.e. asymmetrical relation.

Only through cooperation between the organization of strings of symbols and their schematization, the mechanism inherent in natural language can execute the relationship between observing and symbolizing in a meaningful way. In agreement with formula (1) the Schema as generative process unfolds the mentality governing language production in correspondence with the analytical content of the language produced. Consequently, the three components of the Schema can be used to represent the functional, structural and dynamic aspects of language.

Perspective Differentiation

In order to get hold of the intentionality of the Agent it becomes necessary to apply the Schema concept to the observation of behaviour. This may be illustrated with the following expression:

X action Y (12)

The formula (12) incorporates the assumption that the information embedded in its structure becomes accessible only in relation to activated variables (X, Y). The formula (12) gives expression to the intention of a known or an unknown Agent (X) and his choices of viewpoints (Y) expressing an orientation. It incorporates the assumption that the motivation or interest of the producer of an expression governs the choice of viewpoints, which means that the perspective of the producer is latent in the verbal flow. When the purpose is to analyse various producers' intentions, the formula (12) is unfolded into a system whose variables have a certain range, specified by its field of application.

Running text produced by a person is an expression of consciousness which becomes materialized through the production of natural speech. But consciousness can only be objectified by the text producer itself (X), which implies that his consciousness (Y) incorporates (X):

$X \text{ ----> } Y = (X_1 \dots X_n \text{ ----> } Y_1 \dots Y_n)$ (13)

By applying formula (13) it is necessary to keep apart the variables (X, Y) and to indicate the uni-directionality between them. This function is controlled by the verb. But it is the function of the Agent (the X-variable) to guarantee the coordinative structuring (I. Bierschenk, 1987) by which the variables of formula (13) become interrelated and spatialised, thereby loosing their individuality. The symbol for the verb (---->) implies that the variables are not to be understood as names referring to something. They are variables that can be applied to any text and are at the phenomenological level only virtually identical with the variability of a text. The decisive step is the transition from concept to term or variable, i.e. Agent as a concept to Agent as a variable in a formula. The variable is the make-shift instrument for change of position

and transference. Its logical content is nothing else but a point in a pattern of relations produced by a matrix generation process.

The differentiation of the Y-variable within a perspective clause is made on the basis of prepositions. The prepositions 'on', 'with', and 'for' will be used as prototypes in the description of the unfolding process. Henceforth, these have the function of representing three types of pointers toward structural variability. The perspective order between them is the presented one and refers to the distance from the verb. Variables which are not preceded by a preposition are next to the verb and in direct focus. The preposition 'for' points toward something very distant within the visual field, i.e. at the horizon. This scope of perspectivation is expressed by the following formula:

$$X_1 \text{ -----} \rightarrow Y_1 \text{ on } Y_2 \text{ with } Y_3 \text{ for } Y_4 \quad (14)$$

With respect to the systemic approach, 'for' has priority over the other two prepositions and 'with' has priority over 'on'. This principle governs the relative position of the variables. The algorithmic procedure is as follows:

$$X_1 \text{ -----} \rightarrow Y_1 \text{ with } Y_2 \text{ on } Y_{21} \text{ for } Y_3 \quad (15)$$

$$X_1 \text{ -----} \rightarrow \text{for } Y_1 \text{ on } Y_{11} \text{ with } Y_{12}$$

$$X_1 \text{ -----} \rightarrow \text{on } Y_1 \text{ with } Y_2 \text{ on } Y_{21} \text{ with } Y_2$$

Perspective differentiation is possible only within the Y-variable at the right hand side of the verb. If the same prepositions appear at the left hand side they are treated as integrated in the X-variable. Logically, it follows that only their organizational order is systematized:

$$X_1 \text{ for } X_{11} \text{ with } X_{12} \text{ -----} \rightarrow Y \quad (16)$$

The variable Y can be differentiated without a present or known Agent. The X-variable can always be determined a priori.

When a formal relation appears on the phenomenal level as in the case of 'it', a differentiation needs to be made, which means a specification of the value of the variable. The algorithm detects the

specifying parts of text produced at the left hand side of (X) and recognizes four cases where the X-variable is of unknown value:

((Sentence marker)	(prep -----)	(X) (verb _a)))	(17)
"	" (clause opener -	(X) "	
"	" ((X) "	
"	" -----	(X) (verb _p)	

In the first case, an adverbial phrase initiates the sentence which, systemically speaking, implies a contextualization. Its appearance is substitutional for the X-variable. The second and third cases are easily recognized as question constructions. Furthermore, the third case may also be identified with the imperative construction. The last case refers to passive constructions where the differentiation is carried out at the left hand side of the verb.

Exceptional Variations

A common problem in computational linguistics concerns the analysis of fortious or frozen elements of language such as conjunctions, especially phrases beginning with a conjunctive (Woods, 1973). A phrase exists whenever a clause opener initiates a set of strings that does not contain any distinguishable verb string. Henceforth, such a set will be called 'verbless string'. Because of the frozen information carried by a verbless string it is processed as part of the A-or O-component. Realizations of such exceptional variations arise partly from enumerations, partly from a person's individual way of expressing himself. A verbless string, which is initiated by a clause opener, is formally recognized as one to be connected to the Y-component. If a verbless string ends with a clause opener it is connected to the A-component. Prepositions, on the other hand, do not initiate a verbless string but have the function to mark the division between variables. The division is of conceptual significance and cannot be crossed at its left hand side. These constraints liberate the algorithmic processing from syntactic ambiguity symptomatic of conventional algorithmic analysis of nominal phrases preceded by conjunctives. The mechanism outlined accepts the following observational data strings:

. ----, --- ---> --- or --- on ---, on --- . --->	(18)
. X ₁ + X ₁ ---> Y ₁ + Y ₁ on Y ₂ + on Y ₂ .	

The example shows that the connection is associative (+). The last string is not treated as a subordination (see formulas 15, 16) but as a variation with the same point of reference, i.e. an alternative way of perspectivating. The first string may be imagined as some kind of beginning which is common in argumentative speech.

The section about clause openers contains a description of an organizationally determined redefinition of clause openers. The redefinition of verbless strings aims at redirecting the process of analysis from the organizational to the structural level. For that purpose, strings which in the Swedish language have both a clause opener and a prepositional function are algorithmically converted to prepositions. During the identification phase of the algorithmic processing, their organizational function is superordinated. After the identification procedure is completed, a final dictionary look up is carried out in order to nullify strings which are treated as stop words.

After successful identification, process rules apply, which in agreement with the differentiation principle redefine clause openers only at the right hand side of the verb:

$$\begin{array}{lcl}
 . \text{ If } \text{---} \text{---} > \text{if } \text{---}, \text{if } \text{---}, \text{if } \text{---} \text{---} > \text{---} . & (19) \\
 . \text{ If } X_1 \text{---} > \text{if } Y_1 + \text{if } Y_1 (.) \text{if } X_2 \text{---} > Y_2 . \\
 \text{Clause} & \text{prep} & \text{prep} \quad \text{Clause} \\
 \text{opener} & & \text{opener}
 \end{array}$$

Note. The English translation is only an approximation of the Swedish 'om'. English differentiates on the lexical level (e.g. 'if, 'whether', 'in'), where Swedish uses identical strings.

The third 'if' at the organizational level in combination with a clause opener ',' is first transformed into a sentence marker (.), as in the last case. Because the resulting graphical sentence has no identifiable verb string, it is processed as verbless string and associatively linked (+) left hand sided. This transformation does not apply to the last case of 'if', since a verb string is present in the clause.

The AaO principle generates and accepts distinguishable observational data strings without running into traditional ambiguity problems of automatic text analysis. Because language is a natural phenomenon, whose development takes place in interaction between writing and speech, it is a necessity that the algorithm takes into

account anomalies resulting from grammaticalisations flowing into spoken language as well as styles of speech influencing writing. The point here is, that the commonly considered ambiguous symbol strings become emphasised as such by the algorithm. For example, if the first case of 'if' in the expression (19) would be realised as an adverbial put in front of the clause ('if' as preposition), it would constitute an anomaly with respect to the algorithm.

Differential Equations

What is missing in conventional text analysis is the AaO principle which affords the strings to be identified and processed by a coherent functioning mechanism. Of course, the realisation of the formal components of the Schema vary at the phenomenological level of running text. Therefore, the algorithm works with dummies (*) for the variables (X, Y), which are put into the text at places where the variables are implicit or missing.

The formal relations of the AaO must have an explicit embodiment in the form of differential equations. In order to solve the equations coming into existence, a step is needed where the dummies are substituted with text strings from certain places in the text. A procedure has been developed which makes it possible to solve such a system of equations.

One main principle governing the working of the mechanism is that the O-component of a text has a forward development. This means that the Y-variable is a priori unknown. First after the whole text has been produced it is possible to solve the resulting system of equations. Consequently the mechanism starts at the very end of a text and works its way upward.

The other main principle concerns the A-component and stipulates that the X-variable is steering the development of a text and is therefore a priori known. Hence, the mechanism searches for X by starting at the beginning of a text. Furthermore, as already mentioned, language has its own dummy in the pronoun 'it' whose function is to transfer the X- or Y-variable in the passive case. This dummy is naturally used by the language producer when the X-variables become complex, i.e. they are constructed as clauses and embeddings.

The substitution of the Y-variable has to be made with a variable combination (i.e. $X + Y$), while the substitution of the X-variable

has to be done with a single variable. The substitution of 'it' must be made with a whole clause. The principle of substitution is exemplified by the following functional relations:

$$\begin{array}{c}
 \text{.X}_1 \text{ ---> Y}_1. \quad * \text{ ---> Y}_2. \quad \text{It} \text{ ---> } * \text{.} \quad * \text{ ---> Y}_3. \\
 \text{-----} \quad \text{-----} \quad \text{-----} \quad \text{-----}
 \end{array}
 \quad (20)$$

$$\text{.X}_1 + \text{Y}_1. \text{ X}_1 + \text{Y}_2. (\text{X}_1 + \text{Y}_2) + (\text{X}_1 + \text{Y}_2) + \text{Y}_3. (\text{X}_1 + \text{Y}_2) + \text{Y}_3.$$

As shown in the second part of the formula (20) verbs have been substituted with plus (+) signs. An important property of these relations is the blocking function of the verbless strings when they occur in direct contact with a dummy. Their blocking function prevents the substitution with strings across sentence boundaries. The conceptual information carried by the verbless strings can now be sequentially ordered:

$$\begin{array}{l}
 \text{. X ---> } * \text{ thus -----, ----->} \\
 \quad \text{Clause} \\
 \quad \text{opener} \\
 \text{. X ---> thus -----.}
 \end{array}
 \quad (21)$$

What exactly has been achieved by the formulas (1, 12) is a dynamical mechanism that generates a process which unfolds a three-dimensional structure in accordance with the analytical content of human expressions in natural language.

AaO as Control Mechanism

A dynamic description of the way in which verbal expressions are coordinated requires a set of procedures which can control discontinuity and change in the verbal flow. The way in which clauses and phrases cooperate and interact as well as the way in which the dynamic relationships are observed defines the corresponding natural units. AaO used as a control mechanism determines the natural units of analysis and re-constructs perspective information from the organizationally bound information.

Natural units are the foundation in the system of analysis, which

was presented for the first time in Bierschenk and Bierschenk (1986 c). Structurally defined information is carried by natural units. For the identification and segregation of units of various length an extraction or abstraction process needs to be initiated, which is the first step in a system analysis. Basically, systematic processing is possible if a system can be designed which transfers the abstracted, i.e. variable information during different processing stages, where the original text no longer constitutes the immediate basis. The system developed is based on a nominal scale running from 00 to 90. The two-figure combinations is aimed at carrying the complementary dimensions intention and orientation.

The code assigned to control the sentence markers is (00). From an experimental point of view, this code marks the beginning and the end of a sentence. On the other hand, if the end of a sentence does not concurrently mark the beginning of a new, the system discerns end of text which is controlled by code (90). The demarcations between beginning and end are given by the clause openers which are controlled by the code (01). The beginning of a sentence is thus recognized through a double intentional code (00 01).

Experimentally speaking, to abstract implies the generation of variables. The most important variable in the analysis system is the X-variable representing the Agent from which the verbal flow originates. Thus, the X-variable must be a priori established. It is the prerequisite for the paradigmatic operations to be separated from the syntactic. The code assigned to the Agent-function is code (30). In principle, this code controls the structural information in the position before an active verb.

There are two further functions in the analysis system intimately tied to the X-variable. Both denote the constraints for the variable, one as Context which is assigned the code (10) and the other as Experience which is marked by code (20). Quite naturally, they appear at the beginning of a sentence. The Context component is signalled by prepositions at the beginning of a text while the Experience component is indicated by clause openers. Both have in common that they initiate the procedure which picks up the Agent from its conceptual depth and substitutes it syntactically. In a sense they give a background to the X-variable or demarcate the Agents in the text, i.e. textual Agents.

The asymmetrical functioning of the analysis system implies that any Y-variable needs not be defined a priori. However, in certain text

production situations, a Y-variable is present, constituting a point of reference for the Agent. Within the O-component a differentiation is made between directed and non-directed information. The non-directed information appears in the Agent's figuration, whereas the directed information denotes the ground on which it is presented. Except this 'Figure-Ground' relationship the system also assigns codes to an inbuilt conceptual direction pointing toward Means. They have to be conceived as perspective instruments. Indications of direction pointing toward conditions lying beyond an immediate horizon are imagined as Setpoints. The assigned codes controlling the presented components are the following: Figure (50), Ground (60), Means (70), and Setpoint (80).

An advantage with the codes is that they represent the cooperation between intention and orientation. Thus, aspects of structure and organization are expressed through the hierarchy reflected in the functional order. Structure is denoted by the tens and the organizationally bound order is marked by the units. For example, the code for Figure (5.) marks the most general information, while (.1) denotes some kind of demarcation within this component. In one and the same clause, denotation of intention is imperative for a denotation of orientation.

The basic requirement for the procedures to operate is the definition of the organizational unit. When working with text in its graphical form, the organizational unit can be identified with a graphical sentence. It is demarcated by punctuation marks. A graphical sentence may consist of one or several demarcated graphical clauses. A graphical clause has an independent depth, if it carries structural information. Structural information becomes accessible only through the verb. It is the resting point of the mechanism and has been assigned the code (40). Two or more verbs within one and the same clause indicate that two or more structural units can be discovered within the frame of the clause. A particular characteristic of the mechanism is that it detects an underlying clause and marks it with the general clause opener. Likewise, it positions dummies for absent textual Agents and Objectives such that structural information can be extracted where it is grammatically hidden. Whenever the mechanism has been successful in assigning a 30-code and a 40-code, and at least one of the other codes, a Schema is in operation.

Finally, an important part of the analysis system are the procedures

which pick up conceptual information at certain positions and insert it for the corresponding dummy. In principle, the dummy for the Objective component is replaced with the immediately following Objective or string, while the dummy for the Agent component is substituted with the immediately preceding Agent. In a passive clause, the Objective is picked up from the immediately preceding clause, while the Agent is a priori defined. The general pronoun 'it' transfers information explicitly and is substituted with the information carried by the immediately preceding clause. In the Agent position, 'it' is always substituted with the whole clause, whereas in the Objective position, it is substituted with information from the Objective component of the respective clause only.

The control mechanism operates on natural language through the function and behaviour of the linkage mechanism of Formula 20. The mentality of the text producer always constrains the extent to which the mechanism gives pulsating life to the text. The mental structures constraining its working can likewise be conceived as a pendulum which is levelling out at the point in the text where the equations can be solved. Experiments with naturally produced speech have shown that text contains cycles which are in balance at a point where the equations result in solutions, and hence, formally define a train of thought.

The Rule System

Before a text can be analyzed, instructions for editing textual data need to be given. Textual data are discerned in the following way: The term 'graphical word' refers to the alphabetic or numeric characters between two spaces. A graphical word includes numbers with decimals. Junctural graphemes, which are identified by right-sided space only, have in this analysis the function of a graphical word. It is convenient to mark them with a left-sided space too, for the sake of clarity. The rule system operating on textual data was for the first time presented in Bierschenk and Bierschenk (1936 b) and will be reproduced here. The algorithmic processing of two sentences from a free interview made with a Swedish municipal official will be used to demonstrate the rules and operations of the algorithm.

Identification Rules

Rule 1. Identify the next following sentence marker.

Operation: Assign to the first of to sentence openers code 00

- 1 Rule 2. Define the beginning of a sentence with sentence marker (.).

Operation: Equate the sentence marker with a sentence boundary.

- Rule 3. Identify the strings within two sentence boundaries or sentence boundary and the end of text with graphical sentence.

Operation: Get the sentence for processing.

- Rule 4. Identify clause openers.

Operation: Assign code 01.

- Rule 5. A clause opener does not follow immediately after a sentence marker.

Operation: Insert (that) (Sw. 'att') immediately after the sentence marker. Assign code 01.

- 6 Rule 6. A clause opener follows immediately after a clause opener.

Operation: Assign to the first of two clause openers code 00.

- 7 Rule 7. Identify prepositions.

Operation: Assign to the prepositions codes (60, 70, 80).

- 8 Rule 8. Equate the second, third etc. with the intentional code of the first preposition.

Operation: Assign to the second, third etc. the code of the first preposition.

- 9 Rule 9. Equate a sentence boundary with the end of text.

Operation: Assign code 90.

- 10 Rule 10. Identify verbs.

Operation: Assign code 40.

- Rule 11. A preposition opens an unidentified string before the verb.

Operation: Assign to the unidentified string code 10.

- Rule 12. Identify a new graphical sentence for processing.

Operation: Get the sentence for processing.

- Rule 15. At least two verbs are enclosed within the end of sentence and a clause opener or two clause openers.

Operation: Rank order (verb (1), verb (2)).

- Rule 16. A verbless string is enclosed within the end of sentence and a clause opener or two clause openers.

Operation: Assign to the unidentified string code 01.

Process Rules

Rule 18. Identify the verb with active (a).

Operation: Assign to verb code a.

Rule 19. Unidentified string follows immediately after the verb.

Operation: Assign code 50.

Rule 20. Unidentified string follows immediately after a preposition.

Operation: Assign the code of the preposition.

Rule 21. Differentiate between verb (1) and verb (2) by (that).

Operation: Insert (that) immediately before the second of the two last verbs. Assign to (that) code 01. Remove rank ordering.

Rule 22. The verb is the last string before the end of sentence or a clause opener.

Operation: Insert the symbol (*) after the verb. Assign to the symbol (*) code 50.

Rule 23. The preposition is subordinated to the component.

Operation: Assign to the subordinated preposition the orientation code (.3, .4. ...).

Rule 24. Unidentified string does not follow immediately after a preposition.

Operation: Insert the symbol (*) after the preposition. Assign to the symbol (*) the intentional code of the preposition.

Rule 25. A clause opener precedes a verbless string.

Operation: Assign to the clause opener the code of the component.

Rule 26. A clause preposition initiates a verbless string.

Operation: Transform clause opener into a preposition. Assign to the verbless string the intentional code of the preposition.

Rule 27. A verbless string without preposition follows immediately after a component.

Operation: Assign to the 01-string the code of the component.

Rule 28. A preposition opens a verbless string.

Operation: Assign to the 01-string the code the intentional code of the preposition.

Rule 29. A stop word is a single string and is immediately followed by clause opener (that).

Operation: Insert immediately after the stop word the symbol for dummy (*). Assign the stop word the code of Objective component.

Rule 30. A component consists of several strings.

Operation: Assign to the last string of the component the orientation code (.0). Order the other strings so that the immediately preceding string gets (.2) and the following string or strings (.1). Associate a stopword with the immediately following string.

Rule 31. An unidentified string precedes an a-verb.

Operation: Assign to the unidentified string code 30.

Rule 33. An unidentified string does not precede an a-verb.

Operation: Insert the symbol (*) immediately before the verb. Assign to the symbol (*) code 30.

Rule 34. A verbless string precedes a 30-string.

Operation: Assign to the verbless string code 30.

Rule 41. Identify the verb with passive (p).

Operation: Assign to the verb code p.

Rule 42. An Agent is absent.

Operation: Mark with the symbol (*) immediately before the p-verb. Assign to the symbol (*) code 30.

Rule 43. An unidentified string precedes a p-verb.

Operation: Assign to the unidentified string code 50.

Rule 45. An unidentified string does not precede a p-verb and an Objective is absent.

Operation: Mark with the symbol (*) immediately after the p-verb. Assign to the symbol (*) code 50

Substitution Rules

Rule 48. Identify a passive clause with (40 p) as P-block.

Operation: Number in sequential order.

Rule 49. The symbol (*) within a P-block follows immediately after a preposition.

Operation: Substitute with the reference number of the immediately preceding block.

Rule 50. The symbol for an absent Agent appears within a P-block.

Operation: Substitute the symbol (*) before the p-verb with an a priori defined Agent or with variable (X).

Rule 51. 'it' (Sw. 'det') is a single string within the Agent component of an A-block.

Operation: Substitute the clause with a-verb with the reference number of the immediately preceding block. If no reference exists, then substitute with variable (X).

Rule 52. 'it' is a single 50-string within a P-block.

Operation: Substitute with the reference number of the immediately preceding block.

Rule 53. 'it' is a single string within the Objective component of an A-block.

Operation: Substitute with the reference number of the immediately preceding block.

Rule 54. The symbol (*) is followed by a clause opener within an A-block.

Operation: Substitute with the reference number of the immediately following block.

Rule 55. The symbol (*) is followed by end of sentence within an A-block.

Operation: Substitute with the immediately following 01-string or with the reference number of the immediately following block.

Rule 56. The symbol (*) follows after the verb within a P-block.

Operation: Substitute with the reference number of the immediately preceding block.

Rule 57. A verbless string appears within two clause openers before the symbol (*) for an absent Agent.

Operation: Substitute the symbol (*) with the verbless string.

Rule 58. The symbol (*) for an absent Agent opens a sentence.

Operation: Substitute with an a priori defined Agent or the variable (X).

Rule 59. The symbol (*) for an absent Agent opens a clause.

Operation: Substitute with the reference number of the immediately preceding block plus code 30.

Rule 60. Identify the clause with a (40 a) as A-block.

Operation: Number in sequential order.

Rule 63. Differentiate and integrate the reference numbers in the form of equations.

Operation: Balance the Objective component starting from the end of text. Balance the Agent component starting from the beginning of text.

Rule 64. Substitute the reference numbers with graphical strings.

Operation: Replace a 40-string with the symbol (+). Delete non-associated strings within parentheses.

Rule 65. Integrate (X) by adding a 10-string.

Operation: Combine the variable (X) with the 10-string.

Rule 66. A 10-string opens a clause before the symbol (*) for an absent Agent.

Operation: Substitute the absent Agent with an a priori defined Agent or the variable (X).

Rule 67. Integrate (X) by adding the clause opener.

Operation: Assign to the clause opener code 20. Combine the variable (X) with the 20-string and the preceding string.

As was mentioned in the preceding sections, some dictionaries are needed for identification purposes. The primary task of the algorithmic processing is the identification of the boundaries of the graphical sentences. Therefore, the beginning of a text is always identified by checking the presence or absence of a sentence marker. In case it is absent, a fullstop is inserted. The dictionary contains the strings . ? !. Other strings may be added.

The distinction of a clause is based on clause openers. For illustrative reasons, the following dictionary entries from the example text are given:

Dictionary: Clause Openers

Swedish	English	Swedish	English
att	that	om	if, whether, ...
då	then	sedan, sen	after
där	there	som	who
eller	or	så	so, thus
hur	how	utan	without
men	but	vad	what
när	when	varför	why
och	and	,	,
			o.k.

The prepositions are used as identifiers of conceptual information.

The strings searched for can be either prepositional (i.e. the preposition is the first string of a sequence) or non-prepositional. Spatial prepositions (60 = Ground), instrumental prepositions (70 = Means) and intentional prepositions (80 = Setpoint) are defined as in the following example:

Dictionary: Prepositions

60		70		80	
Swedish	English	Swedish	English	Swedish	English
av	of	med	with	för	for
bland	among				
från	from				
hos	at				
i	in				
på	on				
till	to				

The strings which are algorithmically converted to prepositions are the following clause openers:

Dictionary: Clause Prepositions

Swedish	English
om	if, whether, about
sedan, sen	but, without
utan	then, since

The criteria set up so far for defining verb strings are that the string shall be identified as a stem or a stem plus an inflected suffix belonging to the finite or infinite forms, that an auxiliary shall be regarded as an independent verb, and that identification shall be based exclusively on "intra-string" matching. The consequence of the third criterion is that nominalizations by participles ('de ... anställda' (the ... employed)) are not considered as nouns but verbs. The three criteria together reflect the position that the active voice of the verb is the primary one. Experiments with texts have shown that there will be textual relationships missing, if the nominalized sense is given priority. The intra-string criterion also holds for the passive verb, i.e. the inflected s-form in Swedish. The following dictionary show the verbs of the example text expressed in infinitive form:

Dictionary: Verbs

Swedish	English	Swedish	English
anställa	employ	känna	feel

behöva	need	lägga	put
besluta	decide	motivera	motivate
bygga	build	måste	must
dra	draw	organisera	organize
fatta	grasp	påverka	influence
få	get	ska	shall
gå	go	skita	don't care a damn)
göra	make	slänga	throw
ha	have	spara	save
handla	act	stå	stand up
hjälp	help	säga	say
hålla	hold	ta	take
hända	happen	titta	look
jobba	work	tycka	(be of the opinion)
komma	induce	vara	be
kunna	be able to	visa	show

Finally, the system of rules also requires that stop words of the type 'ett' (a), 'den', 'det', 'de' (the) 'en' (an) are distinguished.

Algorithmic Processing

Based on the presented system of rules, the algorithmic functioning of the system will be demonstrated with the first graphical sentence of an interview about municipal economics (Bierschenk & Bierschenk, 1986 c). The length of the interview is almost two A-4 pages of type-written text and was provided by two doctorate students attending the course Perspective Text Analysis in 1985. The way in which the algorithm works is shown by the processing of the first sentence:

Titta på hur inställningen är idag och det är ju
 (Look at how the attitude is today and it is you know)
 inte bara bland de kommunalt anställda, de flesta
 (not only among the municipally employed, the majority)
 tycker ju att jag har ju min lön,
 (thinks you know that I have to be sure my salary,)
 varför ska jag då hjälpa till med att komma på
 (why shall I then lend a hand finding out)
 hur kommunen ska spara, det skiter
 (how the municipality shall save, that don't care a damn)
 väl jag i.
 (surely I about.)

The English translation given in parentheses is literal from Swedish. The identification and processing is entirely mechanical. It is governed by questions leading to Yes- or No-answers. The outcome produced by the operations associated with the rule in focus are identification or

insertion of Swedish strings which are given step by step, but the assignment of codes is postponed to a later stage:

Question	Outcome	Go to
1. Is a sentence marker present?	No (.)Titta ...i.	Rule 2 Rule 1
2. Is a string immediately following after sentence boundary?	No (.)Titta ... i.	Rule 3
3. Is a clause opener present?	Yes hur och , att , varför då att hur,	Rule 4
4. Is a sentence marker immediately followed by clause opener?	No (.) (att)	Rule 5
5. Is a clause opener immediately succeeded by a clause opener?	Yes varför ,	Rule 6
6. Is there any preposition? på i	Yes på bland till med	Rule 7
7. Are at least two prepositions in immediate succession?	Yes till med	Rule 8
8. Is there any verb?	Yes Titta är anställda tycker har ska hjälpa komma spara skiter	Rule 10
9. Is a preposition preceding a string preceding the verb (left hand side)?	No	
10. Are at least two verbs enclosed between end of sentence and preceding clause opener?	No	
11. Is at least one verb enclosed between end of sentence and preceding clause opener?	Yes	
12. Is the last character of the verb-string 's'?	No skiter	Rule 12
13. Is there any string following the verb (right hand sided)?	Yes	

15. Are at least two verbs enclosed between end of sentence and preceding clause opener or two clause openers?	No	
15. Is the string a preposition?	No	Rule 19
	väl jag	Rule 30
	jag (.0) väl (.2)	
18:1. Is a preposition following?	Yes	
20. Has the preposition priority?	Yes	
21. Is an unidentified string following?	No	Rule 24
	i (*)	
22. Is a a-verb present?	Yes	
23:2. Is a 01-string preceding a 30-string?	No	
18:1.	No	
18:2. Is a verb following?	Yes	
26:1. Are at least two verbs preceding a clause opener?	Yes	Rule 15
	ska (1) spara (2)	Rule 21
	(att) spara	
12.	No	Rule 18
	spara	
13.	No	Rule 22
spara (*)		
22.	Yes	
23:1. Is the verb preceded by an unidentified string (left hand sided)?	No	Rule 33
	(*) spara	
26:1.	No	
26:2.	Yes	
12.	No	Rule 18
ska		
13.	No	Rule 22
	ska (*)	
22.	Yes	
23:1.	Yes	Rule 31
	kommunen	
23:2.	No	
18:1.	No	
18:2.	Yes	
26:1.	No	
26:2.	Yes	
12.	No	Rule 18
	komma	
13.	Yes	
15.	Yes	
16.	Yes	Rule 24
	på (*)	
22.	Yes	
23:1.	No	Rule 33
	(*) komma	

26:1.	No	
26:2.	Yes	
12.	No	Rule 18
	hjälpa	
13.	Yes	
15.	Yes	
16.	Yes	Rule 24
	med (*)	
22.	Yes	
23:1.	No	Rule 33
	(*) hjälpa	
26:1.	No	
26:2.	Yes	
12.	No	Rule 18
	ska	
13.	Yes	
15.	No	Rule 19
	jag	
18:1.	No	
18:2.	No	
19. Is a verbless string enclosed by end of sentence and clause opener or two clause openers?	No	
22.	Yes	
23:1.	No	Rule 33
	(*) ska	
26:1.	No	
26:2.	Yes	
12.	No	Rule 18
	har	
13.	Yes	
15.	No	Rule 19
	ju min lön	Rule 30
	lön (.0) min (.2)	
	ju (.1)	
18:1.	No	
18:2.	No	
19.	No	
22.	Yes	Rule 31
	jag	
23:2.	No	
18:1.	No	
18:2.	Yes	
26:1.	No	
26:2.	Yes	
12.	No	Rule 18
	tycker	
13.	Yes	
15.	No	Rule 19
	ju	
18:1.	No	
18:2.	No	
19.	No	
22.	Yes	
23:1.	Yes	Rule 31
de flesta		

18:1. de flesta	No	Rule 30
18:1.	No	
19:2.	Yes	
26:1.	Yes	Rule 15
	är (1)	
	anställda (2)	Rule 21
	(att) anställda	
12.	No	Rule 18
	anställda	
22.	Yes	
23:1.	No	Rule 33
	(*) anställda	
26:1.	No	
26:2.	Yes	
12.	No	Rule 18
	är	
13.	Yes	
15.	No	Rule 19
ju inte bara		Rule 30
	bara (.0) inte	(.2)
	ju (.1)	
18:1.	Yes	
20. Is a preposition following?	Yes	
21. Has the preposition priority?	Yes	Rule 20
	de kommunalt	Rule 30
	de (.0) kommunalt	
	(.0)	
18:1.	No	
18:2.	No	
19.	No	
22.	Yes	
23:1.	Yes	Rule 31
	det	
23:2.	No	
18:1.	No	
18:2.	Yes	
26:1.	No	
26:2.	Yes	
12.	No	Rule 18
	är	
13.	Yes	
15.	No	Rule 19
	idag	
18:1.	No	
18:2.	No	
19.	No	
22.	Yes	
23:1.	Yes	Rule 31
	inställningen	
23:2.	No	
18:1.	No	
18:2.	Yes	
26:1.	No	
26:2.	Yes	

12.	No	Rule 18
Titta		
13.	Yes	
15.	Yes	
16. Is the preposition the last string?	Yes	Rule 24
	på (*)	
22.	Yes	
23:1.	No	Rule 33
	(*) Titta	
26:1.	No	
26:2.	No	
26:3.	No	
26:4. Is at least one complete AaO-unity (= block) enclosed by sentence and clause markers?	Yes	
26:6. Is the verb in the clause active?	Yes	Rule 50
	A1 ... A12	
26:5. Is end of sentence equal with end of text	No	Rule 12
	Det...motiverade. (...).	
26:5.	Yes	
50. Is there any Objective dummy enclosed in a block? (Go to end of text and search upward.)	Yes	
51. Is there any Objective dummy within an A-block?	Yes	
52. Is the Objective dummy followed by a clause opener?	Yes	Rule 54
	A11 (A12)	
	A10 (A11)	
	A 9 (A10)	
	A 8 (A 9)	
	A 4 (A 5)	
	A 1 (A 2)	
52.	No	Rule 55
A12 (A13)		
40. Does 'it' exist as single string in any block?	Yes	
41. Is 'it' a single string within the Agent component?	Yes	Rule 51
	A12 (A11)	
	A 3 (A 2)	
42. Does an Agent dummy (*) exist within any block? (Search from beginning of text downward.)	Yes	
43. Is there an Agent dummy (*) within an A-block?	Yes	
44:1. Is the Agent dummy preceded by sentence marker?	Yes	

44:2. Is the Agent dummy preceded by 01-string?	No (X)	Rule 58
47. Is there any 10-string?	No	
48. Is the variable (X) preceded by a clause opener?	Yes (X (att)) (X varför)	Rule 67
44:1. Is the Agent dummy preceded by sentence marker?	No	
44:3. Is a clause opener preceded by a 10-string?	No A 4 (A 3,30) A 8 (A 7,30) A 9 (A 8,30) A11 (A10,30)	Rule 59
45. Are there any reference numbers?	Yes	Rule 63

Agent component	Substitution	Block
.(att) (*)	X	A 1
det (A 2)	(inställningen +idag)	A 3
(att) (*) (A 3,30)	(inställningen +idag)	A 4
de flesta		A 5
jag		A 6
varför (*) (A 7,30)	X varför	A 7
då (*) A 7,30)	X varför	A 3
att (*) A 8,30)	X varför	A 9
kommunen		A10
(att) (*) A10,30)	kommunen	A11
det A11	(kommunen+A12)	A12
Det A12	(kommunen+A12) +väl jag i+A13)	A13

Objective component	Substitution	Block
på (*) hur A 2	(inställningen +idag)	A 1
idag		A 2
ju inte bara		A 3
(*), A 5	(de flesta+ju)	A 4
ju		A 5
ju min lön		A 6
jag		A 7
till med (*) att A 9	(X varför+A10)	A 8
på (*) hur	(A10+A11)	A 9
(*) (att)	(A11)	A10
(*),	A12 (A11+väl jag	A11

väl jag i (*).
samma resonemang här
45.

i+A13)
A13 A12
A13
yes
(X varför+på A 9
+kommunen+väl
jag i+samma
resonemang här
på kommunen A 9
+väl jag i+samma
resonemang här
kommunen+väl jag A10
i+samma resonemang
här
kommunen+väl jag A11
i+samma resonemang
här
kommunen+väl jag A12
i+samma resonemang
här
samma resonemang A13
här
No
End

45.

By this mechanism, the system distinguishes the textual from the empirical Agent. It is the empirical Agent who decides which Agents shall present his perspective in the discourse. Processing of text with the algorithm implies a determination of the structural relations unified in the following blocks:

Block	Code	Text
01	01	
	30	X
	40	Titta
	60	på inställningen+idag
02	01	
	30	inställningen
	40	är
	50	idag
03	01	
	30	inställningen+idag
	40	är
	51	ju
	52	inte
	50	bara
	60	bland
	60	de kommunalt
04	01	
	30	inställningen+idag
	40	anställda
	50	de flesta+ju
05	30	de flesta
	40	tycker

och def (x)

06	50	ju
	01	
	30	jag
	40	har
	51	ju
	52	min
07	50	lön
	01	
	30	X varför
	40	ska
08	50	jag
	01	
	30	X varför
	40	hjälpa
09	60	till med X varför+på kommunen
		+väl jag i+samma resonemang här
	01	
	30	X varför
10	40	komma
	60	på kommunen+väl jag i+samma
		resonemang här
	01	
11	30	kommunen
	40	ska
	50	kommunen+väl jag i+samma
		resonemang här
12	01	
	30	kommunen
	40	spara
	50	kommunen+väl jag i+samma
		resonemang här
	01	
13	30	kommunen+väl jag i+samma
		resonemang här
	40	skiter
	52	väl
	50	jag
	60	i kommunen+väl jag i+samma
		resonemang här
	01	
	30	kommunen+väl jag i+samma
		resonemang här
	40	är
	51	samma
	52	resonemang
	50	här

After the operation of Rule 9 the sentence is processed as if it would be the whole text. However, in order to circumvent the variable (Y) in Block 12 the beginning of the next sentence has been added as Block 13. Otherwise, the example would have ended with an unknown Objective.

The orientational variables account for the richness of variation in

the manifestation of one and the same conceptualization. In what way the verb and denoted qualities, which specify and determine, describe and evaluate, demarcate and classify a component may be utilized psychometrically has been reported in Bierschenk and Bierschenk (1976) and Bierschenk (1982). From the structural point of view it is sufficient to process the intention codes only. For that purpose it is necessary to determine the relational affinity between the Agents and their Objectives, which is defined by means of the function of the verb. Thus every Block containing an AaO relation contribute to the construction of the basic data matrices. These are of the conventional Nxp-type, where the Agents make up the rows and the Objectives the columns of the matrix. The elements of such a matrix are $a_{ij} = 1$ for dependence or 0 for independence. Every conceptual code is represented by its own matrix.

Because textual transformations are of a multivariate kind it would be instructive to process a further part of the interview before its multivariate nature is advanced both with respect to its categorical structure and

teleonomic component:

... Det är samma resonemang här, du måste få de här människorna att känna sig motiverade. Det kan du inte göra på terapeutisk väg, det går inte att stå och säga att ok du måste jobba lite mera eller du måste spara så och så mycket. Inte fan känner han det inte utan det måste gå till på något annat sätt. Han måste känna att det han gör har någon betydelse. Och inte minst att man har något utbyte av det. Och det här är fruktansvärt svårt. Det är det svåraste du kan hålla på med. Till syvende och sist är det här en organisationsfråga, t ex hur du lägger upp, i det här fallet, kommunens arbete, hur ansvarsfördelningen är, hur du har delegationen, vad du kan få påverka överhuvudtaget. Till syvende og sist handlar det om det. Det har ju att göra med hur man organiserar det politiska livet precis som du var inne på, L, inte fan har man någon demokrati som det är nu i det här landet. I varje fall inte i ordets egentliga bemärkelse, för det bygger ju på medbestämmande och att människor är medvetna om vad som händer och att de är delaktiga. Inte fan är de delaktiga nu. De tas in som gisslan här någon gång när det behövs. Men det är ju inte så konstigt att det är så. För hur har man organiserat det politiska livet? ...

... It is the same reasoning here, you must get these people here to feel motivated. This you cannot do in a therapeutic way, it is not possible to stand up and say O.K. you must take on and work a little more or you must save so-and-so much. Not the hell he feels that way but it must be done in a somewhat other way. He must feel that what he does has some import. And in any case, that one has some exchange of it. And this is terribly difficult. It is the hardest task you can be engaged on. Last but not least, this is a matter of organization, e.g., how you apply, in

this case, municipality work, how the distribution of responsibility is, how you keep the delegation, what you possibly can influence on the whole. Last but not least, this is what it is about. To be sure, it has to do with how you organize the political life just as you were on, L, not the hell does one have any democracy as it is now in this land. In any case, not in the full sense of the word, for, to be sure, it builds on civil voice and that people are conscious about what is happening and that they are sharing. Not the hell are they sharing now. They are taken in as hostages at times when it is needed. But, to be sure, it is not so strange that it is so, for how has one organized the political life?

Further processing of the preceding text resulted in the following blocks:

14	01	
	30	du
	40	måste
	50	du+de här människorna
15	01	
	30	du
	40	få
	50	de här människorna
16	01	
	30	du
	40	känna
	50	sig
17	01	
	30	du
	40	motiverade
	50	du+du inte
18	01	
	30	du+du inte
	40	kan
	50	du inte
19	01	
	30	du+du inte
	40	göra
	60	på terapeutisk väg
20	01	
	30	du+du inte+på terapeutisk väg
	40	går
	50	inte
21	01	
	30	du+du inte+på terapeutisk väg
	40	stå
	50	du+du inte+på terapeutisk väg+lite mera
22	01	
	30	du+du inte+på terapeutisk väg
	40	säga
	50	du+lite mera
23	01	
	30	du
	40	måste
	50	du+lite mera
24	01	

- 30 du
 40 ta
 50 du+lite mera
 25 01
 30 du
 40 jobba
 50 lite mera
 26 01
 30 du
 40 måste
 50 så och så mycket
 27 01
 30 du
 40 spara
 50 så och så mycket
 28 01
 30 inte fan
 40 känner
 50 han det inte
 29 01
 30 inte fan+han det inte
 40 måste
 50 inte fan+han det inte+till på något
 annat sätt
 30 01
 30 inte fan+han det inte
 40 gå
 60 till på något annat sätt
 31 01
 30 han
 40 måste
 50 han+det inte+någon betydelse
 32 01
 30 han
 40 känna
 50 det han+någon betydels
 33 01
 30 det han
 40 gör
 50 det han+någon betydelse
 34 01
 30 det han
 40 har
 50 någon betydelse
 35 01
 30 inte minst att man
 40 har
 50 något utbyte
 60 av någon betydelse
 36 01
 30 det här
 40 är
 50 fruktansvärt svårt
 37 01
 30 det här+fruktansvärt svårt
 40 är
 50 det svåraste du

- 38 01
30 det här+fruktansvärt svårt
40 kan
50 det här+fruktansvärt svårt+på med X
till syvende och sist+det här en
organisationsfråga t ex
- 39 01
30 det här+fruktansvärt svårt
40 hålla
60 på med X till syvende och sist+det här
+fruktansvärt svårt+det här en
organisationsfråga t ex
- 40 01
30 till syvende och sist
40 är
50 en Organisationsfråga
60 t ex
- 41 01
30 du
40 lägger
50 upp
60 i det här fallet kommunens arbete
- 42 01
30 ansvarsfördelningen
40 är
50 du+delegationen
- 43 01
30 du
40 har
50 delegationen
- 44 01
30 du
40 kan
50 du+överhuvudtaget
- 45 01
30 du
40 få
50 du+överhuvudtaget
- 46 01
30 du
40 påverka
50 överhuvudtaget
- 47 01
30 X till syvende och sist
40 handlar
50 det överhuvudtaget
60 om överhuvudtaget
- 48 01
30 X till syvende och sist+överhuvudtaget
40 har
50 ju
- 49 01
30 X till syvende och sist+överhuvudtaget
40 göra
70 med man+det politiska livet precis
- 50 01
30 man

40 organiserar
 50 det politiska livet precis
 51 01
 30 du
 40 var
 50 inne
 60 på L
 52 01
 30 inte fan
 40 har
 50 man någon demokrati
 53 01
 30 inte fan+man någon demokrati
 40 är
 50 nu
 60 i det här landet
 54 01
 30 X för det
 40 bygger
 50 ju
 60 på medbestämmande
 55 01
 30 människor
 40 är
 50 medvetna
 60 om X vad som+de delaktiga
 56 01
 30 X vad som
 40 händer
 50 de+delaktiga
 57 01
 30 de
 40 är
 50 delaktiga
 58 01
 30 inte fan
 40 är
 50 de delaktiga nu
 59 01
 30 X
 40 tas
 50 de in som gisslan här någon gång
 60 01
 30 X
 40 behövs
 50 X+de in som gisslan här någon gång
 61 01
 30 X+de in som gisslan här någon gång
 40 är
 50 ju inte så konstigt
 62 01
 30 X+de in som gisslan här någon gång
 +ju inte så konstigt
 40 är
 50 så
 63 01
 30 X för hur

	40	har
	50	man
64	01	
	30	X för hur
	40	organiserat
	50	det politiska livet
	01	
	90	

The process of abstracting of structural and organizational aspects of natural text implies that all strings are tested for their distinctiveness. For example, the matching operation shows 49 unique 50-strings, 30 unique 30-strings and 15 unique 60-strings. They constitute the basis for setting up the matrices for grouping the Agents and Objectives. If all codes are adequately represented it would mean that eight matrices have to be analyzed. In the present case the text contains only one 70-string and no 80-string. Conveniently, the existing relations will be analyzed primarily with the focus on the Figure of the text (50-strings).

Dynamics and Linkage

The dynamics of the text gives expression to the intention of its producer. Dynamics generates, modifies or breaks the linkage relations existing between the variables established through the AaC paradigm. Textual dynamics define also the constraints operating in the text. Such constraints can always be expressed in the form of linkage relations. The interaction within and between the 64 established blocks results in linkage relations between the natural units of the text.

Single linkage as a method for grouping of units was developed by Sneath (Sokal & Sneath, 1963). His method builds on the simplest procedure of all the agglomerative methods developed for estimating loss of information in the attempt of finding natural groupings and structural relations in a set of data. Single linkage is defined by the shortest link existing between two units or variables. Other linkage procedures are "complete linkage", "average linkage within the group to be formed" and "average linkage between agglomerated groups" (Anderberg, 1973, p. 137-140). A method which comprise all three procedures has been developed by Ward (1963). His goal was to find an agglomerative procedure which could minimize the degree of disturbance during the process of agglomeration. It is assumed that loss of

information can be calculated for every step in the process of forming pairs of units or groups. Every step implies that all possible unions are utilized with the purpose of finding the agglomeration of pairs or groups which results in a minimum increase of the Error Sum of Squares (ESS) possible.

The first and most important step to decide on concerns the choice of a meter. Applying distance as the meter for linkage seems to be the most suitable procedure when the a_{ij} -matrices give expression to either presence or absence (1, 0) of a relation. Because of the one-dimensionality of the distance measures, the measuring problem is reduced to a Minkovski metric. The algorithm developed by Ward builds on an updating of a saved matrix containing squared Euclidian distances between cluster centroids. The procedure starts with the total set of data units and each unit constitutes its own cluster. This has as its consequence that the number of units in a cluster and the mean of the cluster coincide, e.g., the ESS of the cluster is zero. The minimum rise of ESS for every agglomeration is calculated by means of Analysis of Variance, and thus becomes proportional to the squared distance between the centroids for the agglomerated clusters (Anderberg, 1973, pp. 142-147). Finally, Wards method differs from common centroid methods in that the method weights the distance between the centroids during the calculation of the distances. The solution of the clustering results in a hierarchical organization of bifurcations. The actual computations have been executed with Wishart's (1982) CLUSTAN program.

Generating Analytical Concepts

Analytical concepts originate from argumentation about a subject (kat-agoreuein). The process of categorizing the sample text given on the basis of the described algorithm for Perspective Text Analysis was in 1989 initiated with a group of researchers and research students with degrees in Civil Engineering from the Institute of Natural Science and Technology at Lund. Its aim was to carry out an informal experiment with this group in order to (1) study the manual application of the rule system, and (2) examine the result of the process of concentrating the distinguished categories. Because of the totally mechanical process of identifying and categorizing strings of letters, some of the members of the group were able to produce a near perfect solution. On the other

hand, an error in the rule application or missing an Agent category has as its result some more or less profound structural distortions, as will be discussed in the following.

Prototypical naming of clusters. The prototypical naming of clusters abstract the experience and imaginations from a set of strings of symbols conglomerated within one cluster. The result are analytical concepts whose names are determined by words and symbols making up the cluster. Every concept derived and named is surrounded by a "cloud of intensions" (Hartman, 1967, p. 34) which gives the analytical concept its meaning. Logically, the independence between an analytical concept and its manifold of interpretations constrains its scientific power. Only through a continuously repeated process of abstraction can analytical concepts be refined and possibly purified. What is lost in this process is meaning. Hartman (1967, p. 34) writes:

"The analytic definition seen in analytic purity is like an iceberg whose larger portion, the process of generalization, is submerged."

Thus analytical concepts are independent of each other, i.e. without interrelations. Furthermore, they show only vague relations with their respective clusters. Since analytical concepts are the result of sorting the surface features of a phenomenon, i. e., content, they are experienced to be easily scrutinized and comprehended. The essence of clustering a set of strings can be summarized as the process of assigning a meaningful name to "natural groups". The concentration of the 50-strings into groups that can represent the total configuration of the 64 Blocks presented requires an empirical definition of a cluster. Two premises have been decisive: (1) There is an obvious break in the configuration, or (2) the significance criterion $P(t > T)$ for the t-test has a value of about .05. Applied to the clustering, results give evidence of 12 collinear clusters. Their prototypical character has caused the following variations in the naming:

Cluster 1: Impassiveness, Social consciousness, Feeling of outsidersness, Actor's consciousness

- 1 idag (today)
- 5 ju min lön (you know my salary)
- 6 jag (I)

- 7 kommunen+väl jag+samma resonemang här
(municipality+surely I+same reasoning here)
- 14 du inte (you cannot)
- 22 X utan det+till på något annat sätt (X but it+must be
done in somewhat other way)
- 26 något utbyte (some import)
- 27 fruktansvärt svårt (terribly difficult)
- 32 du+delegationen (You+delegation)
- 36 det politiska livet precis (organized the political
life)
- 39 nu (now)
- 40 medvetna (conscious)
- 41 de+delaktiga (they+sharing)
- 42 delaktiga (sharing)
- 46 ju inte så konstigt (it is not so strange)
- 47 så (so)

Cluster 2: Pattern, Public, Common, Majority

- 2 ju inte bara (is you know not only)
- 3 de flesta+ju (the majority+you know)

Cluster 3: Generalization, Repetition, Individual

- 8 väl jag (surely I)
- 9 samma resonemang här (same reasoning here)

Cluster 4: Management, Organization problems, Difficulties, Non-participation

- 28 det svåraste du (the hardest task you)
- 29 det här+fruktansvärt svårt (this+terribly difficult)
+på med X till syvende och sist (+engaged on X Last but
not least)
+det här en Organisationsfråga (+this is a matter of
organization)

Cluster 5: Manipulation, Hostage, Blackmail

- 44 de in som gisslan här någon gång (they are taken in as
hostages at times)
- 45 X+de in som gisslan här någon gång (X+they are taken in
as hostages at times)

Cluster 6: Politics, Political life, Tactics

- 48 man (you)
- 49 det politiska livet (the political life)

Cluster 7: Significance, Uniqueness, Import

- 23 han+det han+någon betydelse (he+that he+some import)
- 24 det han+någon betydelse (that he+some import)
- 25 någon betydelse (some import)

Cluster 8: Detachment, Dissociation, Non-sharing, Fictitious democracy

- 21 han det inte (Not the hell he feels)
- 38 man någon demokrati (one have any democracy)
- 43 de delaktiga nu (they sharing now)

Cluster 9: Reinforcement

- 4 ju (to be sure)

Cluster 10: Persuasion, Increase, Initiative, Aggregation

- 15 inte (Not)
- 16 du+du inte+på terapeutisk väg+lite mera (you+you cannot+in a therapeutic way+little more)
- 17 du+lite mera (you+little more)

Cluster 11: Motivation, Psychological tool, Delegation, Leadership

- 10 du+de här människorna (you+these people here)
- 11 de här människorna (these people here)
- 12 sig (themselves)
- 13 du+du inte (you+you not)
- 18 lite mera (little more)
- 19 du+så och så mycket (you+so-and-so much)
- 20 så och så mycket (so-and-so much)
- 31 upp (apply)
- 33 delegation (delegation)
- 34 du+överhuvudtaget (you+on the whole)
- 37 inne (were on)

Cluster 12: Organization ability, Organization conditions

- 30 det här en Organisationsfråga (this is a matter of organization)
- 35 överhuvudtaget (on the whole)

Clustering means that a minimally sufficient number of groups can be determined on empirical grounds, and that the same criterion value can be applied to the results of different analyses. The process of abstraction has resulted in the creation of variables with very little deviation in its import. With an experimental perspective it can be argued that the variables determine the conditions which allow the

abstraction to substitute the original text. But more important is that the structured configuration of the Objectives can be observed.

Coordinative Structuring

The crystallization of a system of variables is synonymous with the definition of the state of a system. The way in which different variables or groups of variables are linked to each other give rise to a course which characterizes the dynamics of the original text. The dynamics of the process and the constraints which the various states of the text enforce on this process create synthetic concepts. In contrast to the analytic concepts, synthetic concepts are not to be conceived as an integration exemplified by the prototypical names of the clusters, but result in a network of terms. The development of the network for the 12 clusters will be used to demonstrate the definition of the concept of synthesis:

Impassiveness *Diversification Commonality Challenge*
Pattern Generalization Management Manipulation

Power *Enforcement Dirigism Collectivism*
Politics Significance Detachment Reinforcement

Officialism Obedience Encapsulation
Persuasion *Framing*

Motivation *Framing*
Organization

1.50

It is characteristic of the system evolved that the dynamic formalism of the AaO paradigm creates cooperation and interaction between various AaO unities. The result is a course which differentiates out various terminal states from the set of which the states were part. This segregation process has as its consequence that the course can jump from one path into another. In the description of the empirical phenomenon of "encapsulation" the process leaps from one long path marked by relatively small discontinuities into a second path. Transiting through various terminal states or changing from one path into another creates "singularities". In the example given, these are the synthetic concepts indicated by italics or bold letters. The existence of two paths implies that the demonstrated process is characterized by terminal states (analytical concepts) which differ markedly from each other.

A synthetic concept come into existence together with its Objective. The significance of the concept of linkage for the form of description will be illustrated by means of an alternative structure which is the result of a systematic error in the identification of the Agent (Block 40, 47-49, 54, 56, 62, 64). The calculation has resulted in 12 clusters and has established linkage relations constituting one single path:

Impassiveness *Diversification Commonality*
 Pattern Generalization Non-participation

Improbability Corruption Sanction Dirigism
 Manipulation Politics Significance Dissociation

Collectivism Enforcement Officialism Obedience Framing
 Management Reinforcement Persuasion Motivation

The path demonstrates a different coordination, which means that new linkage relations have been established between the terminal states, and existing relations have been broken. With reference to the original set of data it can be stated that the second structure deviates, because bifurcation points are associated differently as a result of the governing function of the Agent component. A bifurcation is a dividing point where a concealed operation in one type of description becomes visible in another. This is the dynamical aspect of the AaO paradigm which is most amazing, because an unexpected arising consciousness can be discussed in a natural way. Consciousness can with Sperry (1966) be characterized as dynamic patterns which control language behaviour. These patterns effect a course which not only is bound to the texture but is anchored in the mentality. The creation and production of text logically must create "emergent novelties" (Rosen, 1978, pp 90-93).

Textual Transformation

A discussion of textual transformation becomes meaningful first through a redefinition of the concept of text. The phenomenon of the creation of a text as it is treated in the preceding chapters has not taken into account its most fundamental characteristic, namely unity. Therefore, it will be necessary to present the entire interview with the municipal official in order to bring out the teleonomic component of his text:

... Om vi tar K här så har man ju en stor förening där man då drar ihop folk i Folkets hus och slänger på dem en tegelsten och visar overhead-bilder och de fattar inte ett skit. Sen ska man då fatta beslut och vad fan kan de besluta om egentligen, de fattar ju inte ett enda dugg. Du måste ju organisera jobbet på ett helt annat sätt, det kommer ju från fel håll nu. Det kommer ju här uppe ifrån och ner där hela tiden och inte fan går det att få människor engagerade då. Istället måste det komma underifrån och gå uppåt. Och då måste du också ha organisationen på ett sätt som stimulerar till att jobba på det sättet. Man måste alltså, om man tar det politiska jobbet, till att börja med få

jobba med frågor t ex i ditt bostadsområde, som jag överhuvudtaget känner att jag berörs av. På det sättet kan du skapa ett engagemang som du sen kan föra vidare till större frågor. Tro aldrig att du kan skapa något engagemang hos människor om du snackar om situationen för jobbarna i Portugal. Hur ska det gå till? Jobbarna i två grannföretag skiter i varandra. Varför skulle de då bry sig om jobbarna i Portugal. Det är ju så vi jobbar nu. Och det är återigen det jag vill säga att man har glömt det här fundamentala, enkla, nämligen om hur man fungerar som människa. Och nu kan det tyckas att vi håller på att sväva bort i filosofins tassemarker men det hör till det här också. Man får ju inte glömma bort att företagsamhet och att utveckla näringslivet bygger på initiativrika människor. Engagerade människor som är aktiva. Inte har vi skapat några aktiva människor med det samhälle vi har byggt upp. Vi har ju snart institutionaliserat allt. Det är ju i kommunen i någon djävla abstrakt form som sköter din fritid, som tar hand om barnomsorgen och farmor när hon blir gammal och hela det här. Man blir ju beskylld på att vara reaktionär när man pratar på det här viset. Jag är socialdemokrat jag också säger man då och då undrar de hur fan man kan vara det när man tycker som man gör. Men det har inte med det här att göra, utan det är fruktansvärt viktigt att man även i näringslivet fattar det här. Ska du kunna öka företagsamheten så måste du ha aktiva människor. För att få aktiva människor så måste du bygga in det i samhället. Du får inte passivisera som vi gör nu. Titta t ex i våra egna bostadsområden, vad kan jag bidra med där, inte ett djävla skit. Utan kommunen spolar ju isbanan åt mig, de snöröjer isbanan, kommunen sköter jobbet. Det är bara att åka dit och åka skridskor. Istället skulle vi ju ha det så att folk fick själva sätta iordning sin isbana, det hade ju varit värdefullt, inte minst för de sociala kontakterna. Men inte ens sånt har vi ordnat, utan istället så har vi satt dit en massa tändsticksaskar där var och en sitter och glor på dumburken på kvällarna. Och lägg märke till att det här hör ihop även med sådana saker som näringslivet. Så stor är den här frågan. (Sen gick B)

... Let us take K here, to be sure, one has a big association where one brings together people in the People's Palace and throws a brick on them and displays overhead pictures and they don't catch a damn shit. Then one shall take decisions and what the hell can they decide on after all, sure, they don't catch one thing. Sure, you have to organize the job in a totally different way, sure it comes from the wrong direction now. Sure, it comes from up here and down there all the time and not the hell it is possible to get people engaged then. Instead it has to come from below and go upward. And then you also must have the organization in a way that stimulates to work in this manner. Therefore one must, if one takes the political job, to begin with be able to work with questions for example in your housing area which on the whole I have a feeling for. In this way you can create an engagement that you can carry over to bigger questions later on. Don't believe that you can create any engagement in people if you talk about the situation of workers in Portugal. How would it be done? The workers in two neighbour companies don't give a damn in each other. Why then should they care about the workers in Portugal? Sure, this is the way we are working now. And again it is this I want to say that one has forgotten this fundamental simple thing, namely about how one functions as a human being. And now it may seem as if we are floating away into the domain of philosophy but it belongs to this too. Sure, one must not forget that enterprise and developing economy build on enterprising people, engaged people which are active. Sure, we have soon

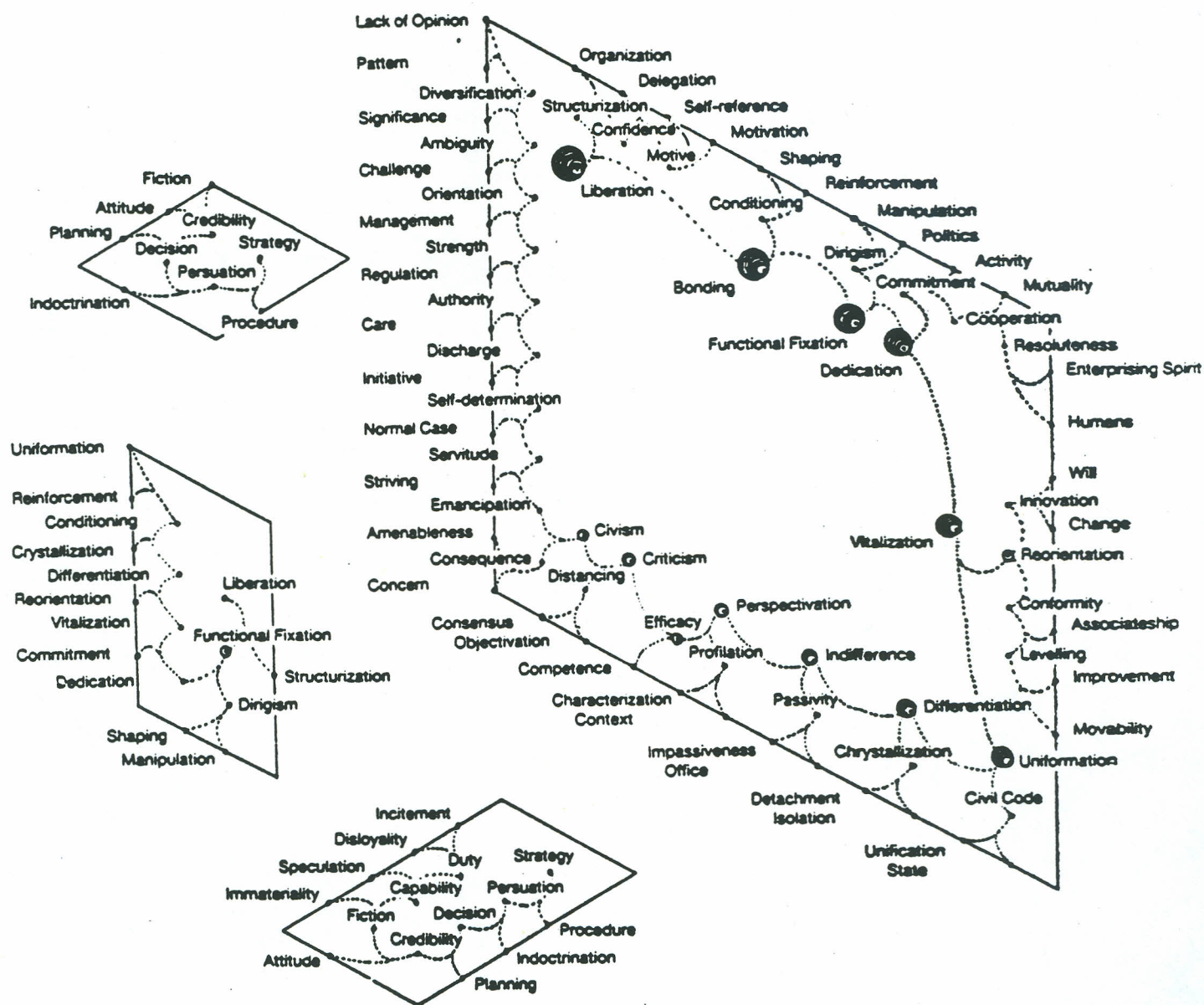
institutionalized everything. Sure, it is the municipality in some damn abstract form that takes care of your spare time, that manages child care and grandma when she becomes old and all this. Sure, one becomes accused of being reactionist when one talks in this way. I am a social democrat myself too one then says and then they wonder how the hell one can be it when one thinks the way one does. But it has not to do with this here but it is terribly important that one also within the economy grasps this. If you will be able to increase enterprising then you must have active people. To get active people you have to build it into the society. You must not make them passive as we do now. Look for instance in our own housing areas, what can I contribute with there, not a damn shit. Since the municipality flashes the ice rink for me, they do the snow-clearance of the ice rink, the municipality carries out the work. It is just to go there and skate. Instead, sure, we should have it so that people had to arrange for their ice rink themselves, sure, it had been valuable, not least for the social contacts. But not even such things have we arranged, but instead we have put a mass of match boxes there, where everyone is sitting glaring at the sillybox in the evenings. And notice that this has to do with such things as the economy. That big is this question. (Thereafter B left)

The textual transformations in the text presented are of a multivariate kind and therefore far too complex to be comprehended without a graphical representation. The basic idea underlying the preceding chapter is that textual transformations have to be conceived as a series of equivalent relations which can be established through clustering procedures. The resulting terminal state variables establish the link between the original text and the prototypical namings which have been abstracted from the text. The dynamics underlying the original text has produced 40 significant groupings which are indicated by the terminal states of Figure 1. (The topographical representation was first published in Bierschenk and Bierschenk, 1986 c)

The Textual Figure or Imagination

The background represents the Figure component of the text while the foreground represents the perspective on the Figure. The bottom plane takes up the Ground component while the top shows the perspective on the Ground.

Each side of any of the planes can be conceived as a one-dimensional interval, which defines the development of the textual process. Thus, they form space x time matrices which define the control space (C) within which the development occurs. In the actual case the Figure component



Topographical representation of the cognitive process as it emerged from an interview with a Swedish official. The Figure describes the person's fixed situation in the hierarchy and his desire for a change: it ends up in Liberation.

From "Concept formulation. Part III. Analysis of mentality" by B. Bierschenk, I. Bierschenk, 1986, *Kognitionsvetenskaplig forskning* (12), p 14.

requires 40 terminal states for a complete specification of the textual discourse, i.e the phase space. The specific way in which the terminal states are related with each other define the course taken in the discourse. By relying on the specific dependency defined through the ESS values of Ward's (1963) algorithm it is possible to build up a topography which allows the representation of both processes and structural (in)stability.

When continuous changes in the independent parameters evoke discontinuity, this can be represented as a singularity. Any singularity defines the highest point of the unfolding curve at any time a singularity can be established. Thus a singularity exists independently of the kind or degree of deformation of the curve which topologically defines the existence of an invariance (Woodcock & Davis, 1978, p. 7).

Contextualization

From a formal logical point of view the topologically defined invariance is a point where two relations cross each other or where a bifurcation arises. Every time when a bifurcation can be observed, it points toward some discontinuity in the argumentation. If the changes are small which produce a structural instability within the phase space, then this results in a path. The path can be described by termini which means limits where analytical concepts are transformed into synthetic relations. The first path in the background of Figure 1 begins with the synthetic concept *Diversification* and terminates with *Emancipation*. Any time the transition from one terminal state into another produces a sudden jump a new path is created, which means that the textual description causing this kind of jump mediates information that in a sense is fundamentally different from the information described by the preceding path.

Figure 1 makes explicit the type of operation causing two paths. The discontinuity in argumentation has as its consequence that a very short path is created by the terminal states "Amenableness" and "Concern" leading to the singularity *Consequence*. This second path crosses the first one in the terminus *Civism*. The circle around this term indicates that it is deeper embedded in the conceptual structure than its preceding singularities. Presupposing that consciousness is identical with synthesis it can be stated that the process implies a decreasing series of infinite steps toward no-thing. In Kantian terminology, the

terminus of this infinite series is "das Ding an sich" (Hartman, 1967, p. 333), i.e. that which is given, namely the invariant.

Looking at Figure 1, it becomes obvious that the curve develops counter-clockwise, although its meaning has to be read out clockwise, because the terms make sense only within the context of the path. If we pause for a moment, implying that the terminus *Civism* describes the final point of the curve, we find that the very short path discloses the requirement of responsibility while its longer path develops around the conditions for contextualization where the train of thought finalizes in *Emancipation*.

The Empirical and Textual Agents

The most fundamental and functional dichotomy of the cerebral hemispheres in man is the "language-context" dichotomy (Cook, 1986, p. 147). This implies that language in the first place needs to be treated as a means of communication or as the medium with and through which the consciousness of man gets its expression. Thus, *Civism* gives expression to the I-you relation as a means of organizing and reorganizing basic interpersonal relations through speech. Sperry (1966) considers consciousness as the mental phenomenon which controls human behaviour. The configurational attributes of the patterns have, according to Sperry, causal control potential. In this process language has a decisive function which psychological research has never been able to disregard. A science of consciousness, i.e. structural psychology (Ornstein, 1972), is only possible if verbal communication can be made the point of departure for exactness in measurement and representation.

Consciousness prerequisites an empirical Agent, i.e. an individual having the ability to cooperate with its environment. Without this ability no consciousness can arise, because 'scio' (I know) and 'con' (with) means knowing with others. In this respect consciousness has to be considered a cognitive effort which any individual of any generation has to achieve anew. Development of consciousness becomes possible only under the condition of a language that creates an operative space within which the empirical Agent can act in the form of textual Agents and narrate alternative acts and consequences (Jaynes, 1976). By that, consciousness ties a "knowing" subject with a "knowable" object or event.

Consciousness emerges from the cooperation and interaction of

multiple Agents. Every Agent contributes with its intention to the materialization of a text. The prototypical properties emerging from the grouping of Agents present structural similarities with properties belonging to the Agents of a certain group. The relationships brought about by the coherence of the Agents ties multiple textual Agents together into agencies. These are in turn recursively grouped and the interrelations of the groupings create the conditions from which the properties of a system arise. It is important to systematize the ways Agents and agencies are interacting and changing throughout a text, because a set of Agents can be seen to cohere and interact in such a way that their attributes define the nature of the system. Moreover, clustering shows whether and to what extent they have created properties which the topographical representation alone can manifest.

Synthetic concepts, more or less embedded in natural language expressions, are the result of the discovery of the steering and controlling function of the Agent component. This mechanism can only be discovered if the construction of language expressions gives space for the symbolization of the I-function, i.e the empirical Agent. When this function is concealed or non-detectable in verbal behaviour, it deprives us of the possibility of knowing what is symbolically expressed. Moreover, if there is no discoverable I-function, a verbal expression cannot be recognized as an intentional act, and logically, cannot serve its purpose of providing meaningful information either. Sperry, Zaidel, and Zaidel (1979) have been able to show that both the non-dominant and the dominant hemisphere have the ability of perceptual awareness of sensations. But with reference to the I-function, it is only the dominant hemisphere that reacts cognitively. If the dominant hemisphere shall be able to conceive "the I" of a unique being, it is necessary that the intentional component of language is perceivable, i.e language must be recognized as a self-referential system.

Language marks the difference between consciousness and self-consciousness (Eccles, 1980). Self-consciousness appears when individual variations can be comprehended in that I-me and you-me relations can be synthesized into an I-function and communicated through language. Therefore, self-consciousness develops only under the condition that a metaphorical "I" can operate in language.

Consciousness

The concept of consciousness is multifaceted which has caused a number of different definitions (Natsoulas, 1983) and its use with various contents (Jaynes, 1976). In his discussion of consciousness, Jaynes observed that the concept in the beginning of its scientific use was considered to represent an attribute of matter. During later periods, consciousness was conceived as an attribute of protoplasm or at times as the result of learning processes. Last but not least, consciousness has also to carry a great deal of philosophical overload. Primarily the concept seems to be used to indicate the state of alertness of a normal adult person (Hebb, 1980 p. 20). With alertness it is meant a person's ability to interact with his environment. In this sense, the concept is equivalent with awareness, meaning the social or joint use of knowledge as it gradually crystallizes through a discourse emerging through speech.

Thus, the Figure component seems to pick up the fact or state of being aware of anything, which implies a generalization of persons, objects and events into significant others, often expressed by 'it'. In a sense, one may be conscious either of one's sensations and feelings or relational thoughts, i.e. that something is the case. A look at Figure 1 immediately makes possible a discrimination of termini pertaining to the sphere of sensations and feelings. They all require a second step on the time dimension. Where these termini give rise to the second step, the resulting singularities point toward relational awareness, i.e., a kind of thinking which led to the hypothesis of "imageless thought" put forward by Oswald Kuelpe (1862-1915). "Imageless thoughts" are deeper embedded in the cognitive structure and as a matter of fact without any implications as to contents that can be described in terms of sensational attributes.

Accommodation. This aspect of the Figure component is indicated by two contrasting paths. The first one results in *Conformity* while the second one ends in *Innovation*. When the second one crosses the first path, consciousness is determined by *Reorientation*, which is basically a judgement of one's own possibility to come to solutions allowing an adaptation to fundamental changes, by changing one's own value system. Considering the singularity of *Reorientation* and how it transforms *Uniformation* into *Vitalisation*, it becomes obvious that the two paths give expression to a relation between a generalized person and himself.

Adaptation. Three distinctive paths have been identified. The first two result in singularities such as *Dirigism* and *Conditioning*, pointing toward the existence of a modern form of Jaynes's (1976, p. 328) "collective cognitive imperative". It implies the acceptance that authoritative figures control the behaviour of single individuals. Moreover, when this kind of control is institutionalized and generally accepted or tolerated, this means limiting consciousness and may imply a "weakened" I-function (Hilgard, 1986, p. 31). On the other hand, both deeply embedded terms expressing the higher order functions of *Functional Fixation* and *Bonding* are preceded by the function of *Dedication* and succeeded by the function of *Liberation*. This means that the empirical Agent has not accepted a manipulation of his consciousness through ritualized procedures into the state of non-consciousness.

To summarize, the topographical representation of the cognitive process as it emerged from an interview with a Swedish official implies that the text of the interview contains different kinds of consciousness and its development throughout the text. Further, it implies that knowing can be defined as the result of the process of perception in which an actively inquiring Agent creates an information synthesis. If he is in the position to communicate the results of his synthesis, then knowing becomes public, which means that another person shares or is at least able to share what one knows. In this respect, consciousness has become a scientific fact.

Perspectival Transformation of the Figure

The transformational process depicted in the foreground shows a much smaller topography. It is the result of the asymmetrical relation between the textual Agents and the viewpoints of the text. The starting-point for the extraction of the perspective out of the background is the grouping of the Agent variables which get their prototypical descriptions through the variables grouped in the analysis of the Figure component. Thus, the Figure component and its invariants form the frame of reference for perspective transformation.

The perspective displays some central aspects which have come into focus of the empirical Agent and can easily be demonstrated by the highly embedded terminus *Uniformation* describing the first Agent group of the plane representing the perspective. Logically, the notion of "Contextual Awareness" makes sense as an adequate summary of the

first two dimensions of the Figure component. By tracing the next following Agent group to the prototypical name of "Reinforcement" it is possible to show that *Conditioning* is the highest point of this curve and thus defines the first singularity of the perspective. By following through this process the focus on the Figure evolves. Moreover, the transformation and reorganization of the topological relations create a certain systemic permanence.

The perspective is characterized by one embedded singularity implying that *Functional Fixation* has a certain structural solidity. In that the process moves toward a prototypical concept, *Liberation* appears as highest point of the curve but without any embedding. Thus, the final point is structurally disclosed.

The Textual Ground or Reason

Reasoning means stating a ground for imagination. However, in natural discourse this ground may be more or less structurally given and extractable. Fortunately, the textual transformation in Figure 1 shows the existence of a ground, which is described by one long path. There is no sudden jump and hence no minimum disappears entirely nor is there any intervening maximum present. Thus, characteristic of the Ground component is its one-dimensionality. In its entirety the path gives expression to the range of possible actions.

Perspectival Transformation of the Ground

Instead of describing the range of action in detail it is more informative to consider the Ground with an eye on the transformational changes which occur through perspective focussing. The perspective on the Ground has also resulted in one path, although it picks up only part of the path developed in the Ground. What disappears are prototypical concepts and systemic terms which are related to the organizational frame. This explains why *Functional Fixation* in the perspective on the Figure is structurally more embedded, and thus less obvious, than *Liberation*. What is in the focus of the perspective on the Ground is the action potential of the empirical Agent which, of course, is the prerequisite for liberation.

The Dual Control Structure of Bonding and Liberation

Bonding designates a fundamental psychological process of import for the establishment of a strong attachment of mother to infant and infant to mother. It develops shortly after birth. Depending on the mother's protectionistic behaviour, liberation or breaking the bond creates more or less severe anxiety reactions both in infant and mother. This dual control structure should be of concern to every one, because inbuilt in the mechanism is the orientation toward obedience and punishment. Consequently, the bonding-liberation relationship becomes transformed through educational and socialization processes into the broader areas of social life.

Moreover, the values of the collective are transmitted through bonding. The individual's ability to discriminate between right and wrong is the result of a learning process where obedience to laws and regulations is reinforced. This learning process takes its departure in similarity as well as in authority figures indicating what has to be perceived as right. What can be demonstrated and secured by bonding is that a person has been successful in learning to discriminate between predefined dimensions by continually choosing the correct behaviour. People who are collectively behaving that way, on the other hand, give no indications about their consciousness of what it is that is right or wrong.

Intimately associated with the concept of liberation is the concept of consciousness. In this context, consciousness implies that a person has been able to develop a personal conceptual structure through which he becomes able to act in a genuine way when confronted with the question of what is right or wrong in the "official moral". Consequently, any person who holds an official position and has a strong conviction about the right and wrongs in the official moral has a great advantage in times of crises or under great pressure compared to persons who are bonded, i.e. have been released from the compulsion of taking responsibility.

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